DOCUMENT RESUME

ED 307 693 EA 021 016

AUTHOR Fowler, William J., Jr.
TITLE School Size, School Characteristics, and School Outcomes.
PUB DATE Mar 89
NOTE 36p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco, CA, March 27-31, 1989).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Institutional Characteristics; *Outcomes of Education; Resource Allocation; School Districts; *School District Size; *School Size; School Statistics; Secondary Education; Social Indicators; *Socioeconomic Influences; Teacher Characteristics; Teacher Student Ratio
IDENTIFIERS *New Jersey

ABSTRACT

A study investigated the possible dependence of educational outcomes on staff attributes and organizational size once socioeconomic indexes are taken into account. All data were obtained from the New Jersey Department of Education. The variables of interest and their operational definitions include school characteristics, teacher characteristics, district scholastic aptitude tests, district characteristics, and many school outcomes. Seven variables were significant: percentage of low income students in a school; size of school; number of schools; percentage of teachers with a bachelor's degree; pupil-teacher ratio; average teacher salary; and the district's socioeconomic status. An inverse relationship between school size and student outcomes is demonstrated. The size of schools may also affect the internal allocation of funds from the school district. Appended are 32 references, a 5-page list of variable definitions, a table of univariate statistics, and a table of results of backward stepwise regression. (SI)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED307693

School Size, School Characteristics, and School Outcomes

William J. Fowler, Jr.

Office of Educational Research and Improvement

National Center for Education Statistics

A Paper Presented to the

American Educational Research Association

Annual Meeting

March 31, 1989

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

Minor changes have been made to improve reproduction quality.

Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

William J. Fowler, Jr.

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

The author accepts full responsiblity for the analysis and conclusions expressed in this paper, which do not reflect the views and policies of The National Center for Education Statistics.

EA 021 016

BEST COPY AVAILABLE

Abstract

To investigate school size effects for secondary schools, eighteen school outcomes, including the average scores on state-developed tests, student retention, suspensions, post-school constructive employment and college attendance for 293 public secondary schools in New Jersey were regressed on twenty-three independent school characteristics, such as percentages of students from low-income families, school size and number of schools within each district, teacher characteristics, such as salaries, degree status, and years of experience, and district socio-economic status. District socioeconomic status and the percent of students from low income families in the school were the most consistent factors related to the schooling outcomes. School size was the next most consistent, and was negatively related. This finding agrees with previous research conducted primarily at the public school elementary level, and suggests that smaller public school districts and smaller public schools, regardless of grade level, may be more efficient at enhancing educational outcomes.

** School Size and School Outcomes **

The objective of this study was to investigate the association of many school outcomes, with school and district characteristics. The outcomes included not only student achievement but also retention, suspensions, constructive employment and college attendance. The school characteristics included school size; the number of schools within each district; teacher characteristics such as salaries, degree status, and years of experience; and school percentages of students from low-income families and district socioeconomic status. The study is an extension of previous work conducted at the school district level in New Jersey (Walberg and Fowler, 1987). Rather than public school districts as units, however, this study involved 293 public secondary schools.

The study explores the possible dependence of educational outcomes on staff attributes and organizational size once socioeconomic indexes are taken into account. Previous research has generally been conducted at the public elementary school level, and been more limited in sample size, simultaneous weighting of both school and district size and socioeconomic status, and in the diversity of school outcomes.

Literature Review

Among the earliest works to explore the question of school characteristics and achievement was based upon a study of schools in New York state (Kiesling, 1968). He found a negative

relationship between achievement tests (math and verbal ability tests) and school size. His sample included schools with enrollments between 200 and 4000 students, and controlled for socio-economic differences.

In 1970, the belief in a relationship between teachers' salaries, benefits and student achievement was so strong that plaintiffs in Hobson v. Hanson, a court case challenging resource distribution in the Washington, D.C. school system, argued that expenditures for teachers' salaries should not be permitted to vary by more than five percent from school to school. Michelson (1972), in a study for the plaintiffs of 110 elementary schools, which varied in size from 139 to 1710 in membership, found

> "size does seem to affect the pupil/teacher ratio, but the pupil/teacher ratio has no effect on achievement. In fact, one either concludes that more pupils per teacher increases achievement or that no productive relationship is shown here" (p. 296, emphasis in original).

Michelson further found, using a path analytic procedure, that the output measure (reading achievement) was primarily a function of social class (median income of school attendance area; percent of pupils participating in the free lunch program). He concludes that

> "an increase in size of school is detrimental to test scores, all else considered....but the implication is that large elementary school size is detrimental even if pupil/teacher ratios are held constant" (p. 304).

Chambers (1972) analyzed size differences in public and private

schools, finding that private schools operated at 60 percent of the size of the average public school. His review of then extant literature led him to the conclusion that large school size had a possibly negative impact on achievement, and on affective outcomes, such as student participation and satisfaction.

In a extensive study of 98 comprehensive public high schools and their effect upon students' test scores, eventual educational attainment, or occupational status, utilizing Project Talent data, Jencks and Brown (1975) concluded that

> "high-school characteristics such as social composition, per-pupil expenditure, teacher training, teacher experience, and class size have no consistent impact on cognitive growth between ninth and twelfth grades" (p.320).

These findings led to a subsequent analysis of 630 high schools with EEOS data, which confirmed the initial results. Presumably, class size was higher in large schools, although Jencks and Brown apparently did not measure this dimension.

Summers and Wolfe (1976) examined the school resources which possibly influence academic achievement for 150 public schools in Philadelphia, Pennsylvania, using a sample of 627 elementary students, 533 junior high school students, and 716 high school students, and matching students to their teachers' characteristics. They found the socioeconomic background of the student largely determined achievement. They also found, however, that

> "in smaller schools increased learning at elementary and senior levels appears to take place. Black elementary students seem particularly to benefit from being in smaller schools, and low achievers in smaller senior high schools" (p. 6).

Differences in teacher experience had a positive effect upon high achievers, and a negative effect upon low achievers. Large class size did not have a negative effect unless it exceeded 34 for elementary students, 32 for junior high school students, and 26 for high school classes. Teachers that had attended a more prestigious college also had a positive effect upon achievement. Whether or not the teacher held an advanced degree had no effect upon achievement.

In a study of a sample of 1,021 New York State elementary schools, Wendling and Cohen (1981) found school size negatively related to third grade reading and mathematics achievement, when controlling for student SES. Low achieving elementary schools had a mean size of 776, while high achieving schools had a mean size of 447. In addition, higher pupil-teacher ratios were related to higher achievement. The authors included two measures of socioeconomic status: percent below poverty and median years of parental schooling.

Lindsay (1982) replicated the work of Barker and Gump (1964) on the effects of school size. Using a representative national

sample of.14,668 students in 328 elementary schools from the National Longitudinal Study (NLS) of 1972, Lindsay found higher extracurricular participation, higher student satisfaction and attendance, particularly for females, in small schools (class of 100 or less). Even controlling for SES and student ability, the size of school had an independent effect. With minor exceptions, the effect of school size occurred in both urban and rural schools.

Using a subsample of the "Sustaining Effects Study" data obtained by Systems Development Corporation (SDC), Eberts and others (1984) examined 287 elementary schools ranging from less than 200 pupils in attendance to over 800 pupils. They found that smaller elementary schools had higher student achievement, even when controlling for student, teacher, principal and school climate characteristics.

The impact of high school size on dropout rate was explored by Pittman and Haughwout (1987), using 744 schools from the High School and Beyond Study. They explored only four school variables, without controlling for socioeconomic status: dropout rate, school climate, program diversity, and size. They report that larger student bodies produce a poor school climate that encouraged dropouts.

> "...For every 400-student increase in the high school student population, there would be approximately a 1%

rise in the dropout rate at that school" (p. 343).

Downey (1978) studied the persistence of small high school effects for 400 randomly selected freshman students into their first four semesters at college.

> "In general the number of accomplishments and size of school were related, with students from smaller schools achieving a larger number of accomplishments. This relationship was particularly strong for the leadership, music and speech scales, with moderate differences for the writing and athletic scales." (p. 357)

Thus, a number of studies over the last twenty years, particularly at the elementary school level, have found small school size to have an independent, positive effect upon student achievement, extracurricular participation, student satisfaction, and attendance. This research was designed to examine a wider range of student outcome measures for a large number of secondary schools within a single state, with extensive variance in school size and number of schools within each school district.

Method

All data was obtained from the New Jersey Department of Education. School characteristics and teacher characteristics are collected annually by the Bureau of Information Services, Division of Administration, with a data collection instrument called the "Fall Survey". School-level tests were obtained from the Bureau of Testing, Division of General Academic Education. As

of the 1984-85 school year, school-level test results were available only for those schools containing a ninth grade. Of 332 schools with ninth grade enrollment, test data was available on 293 (88%). Non-tested schools typically contained only special school populations, such as handicapped students.

The variables of interest and their operational definitions appear in Table 1. These include school characteristics, such as percentages of students from low-income families and district socio-economic status; school size and number of schools within each district; teacher characteristics, such as salaries, degree status, and years of experience; and many school outcomes, that included not only student achievement but also other outcomes such as retention, suspensions, and post-school constructive employment and college attendance. Table 2 shows the means, standard deviations, and minimum and maximum values for all variables, as well as the coefficient of variation.

School Characteristics

The measure of school size employed was total enrollment for the 1984-85 school year for all grades, as collected on September 30, 1984. This measure may overstate the operational size of some schools, particularly urban schools, where their average daily attendance is 10-20% below their enrollment. However, the total

enrollment figure was utilized because it represented the potential enrollment of these schools, on which per-student teaching staff and expenditure ratios were determined. Although claims are often made that urban school districts experience transient student populations which increase enrollments, in New Jersey the majority of schools, regardless of urbanicity, are experiencing enrollment declines, particularly at the secondary level. As shown in Table 2, the average total enrollment of the 332 schools was 1070, with a minimum of 147 students and a maximum of 4,018.

The pupil/teacher ratio was employed because of the absence of data regarding average class size. This measure may understate the pupil/teacher ratio because only full time certificated teachers were counted. Utilization of additional part-time and remedial instructors (considered special services staff, rather than instructional staff) would further lower these ratios. The 293 schools with test data had a mean pupil/teacher ratio of 15.18, with a minimum of 7.16, and a maximum of 23.19.

Three measures capture non-test performance of schools. The percent unsuspended and percent retained (not excluded by the school's administration) may indicate school success in maintaining a desirable learning climate. As demonstrated by Hyman, Wright, and Reed (1975), some enduring effects of education may not be immediately detectable, and may lead to increasing know-

ledge in later life. In this regard, simple retention of students may be a very desirable outcome of schools, possibly as important as mean academic achievement. In some ways, the most desirable non-academic measure is percent of graduates from a school who achieved constructive employment. However, schools varied in the number of the graduating class they pursued in their follow up. As a result, only the employment percentage of the group followed could be obtained. For the vast majority of schools, the entire class was followed, but for certain schools, particularly urban schools, the reported employment percentage undoubtedly represents a higher degree of success than a more complete sample would indicate. The mean percentage constructively employed was 90.6%, ranging from 50 to 100%. The percent retained averaged 98%, with the minimum 87% and the maximum 100%. The percent unsuspended averaged 87%, ranging from 28 to 100%.

The socio-economic measure at the school level was the percentage of enrollment with family incomes less that $10,686. This was the poverty line for a family of four in 1984-85. The mean was 10%, with the minimum 0% and the maximum 88%.

Teacher Characteristics

The teacher characteristics collected by the New Jersey Department of Education included the teacher's salary, degree status, and experience in their present school, in the school district, in the State of New Jersey, and in the field of education. In

1985, the average teacher salary in the 293 high schools was $25,533, with a minimum of $19,051, and a maximum of $34,697. The mean number of teachers in the 293 high schools was 73, with a minimum of 19, and a maximum of 233. These teachers averaged 10 years of experience in their school, 12 years in that school district, and 13 years in New Jersey.

Test Characteristics

In response to 1976 State legislation, the New Jersey Department of Education developed the Minimum Basic Skills (MBS) test to measure proficiencies necessary to function politically, economically, and socially in a democratic society. Starting in 1981-82, the MBS test was used to satisfy the State graduation law, and to determine students in need of remediation. The purpose of the subsequently-developed High School Proficiency Test (HSPT) was to replace the MBS test and to measure a set of higher skills than measured by the MBS and to satisfy the State graduation law. Both tests are administered in the spring to ninth-grade students.

The Department engaged in an elaborate procedure with expert assistance from the Educational Testing Service (1978-79), National Evaluation Systems (1980-84) and National Computer Systems (1984 to present) to produce valid tests that reflect the consensus of educators and other groups in the state about what

is important for students to learn. The tests have internal-consistency reliabilities in the range beyond 0.90, which is more than adequate for group comparisons. The 1984-85 school level achievement tests are shown in Table 1. The first five are State tests of Minimum Basic Skills in Reading and Mathematics, and the scores are expressed as means for the school and percent not meeting state standards, on one or both tests. The next ten tests are State tests of High School Proficiency which consist of a multiple-choice writing examination, a written and graded essay, and multiple-choice tests of reading and mathematics. The scores are expressed as both percent passing the state standard, and the mean score of each school.

As shown in Table 2, the average MBS reading and mathematics scores were 93.64 and 86.87, respectively. The highest failure rates on these minimal skill tests were 22.78% in reading and 16.54% in math. The highest combined failure rate on both tests was 12.74%. The percentage passing the HSPT were much lower, with mean scores for the 293 schools reported as 57.13% in writing, 60.85% in mathematics, and 72.47% in reading. The lowest scores for any school were 6.4% passing the HSPT writing test, 7.2% passing the mathematics test, and 13.3% passing the reading test. The mean scores on the HSPT writing test were 80.39, 65.10 on the mathematics test, 80.75 on the reading test, and 78.60 on the writing multiple choice test.

District Characteristics

The remaining measures in Table 1 are district-level characteristics regarding size, number of schools, expenditure per pupil, district socioeconomic status and per pupil property wealth, and when reported, district average Scholastic Aptitude Tests (SAT) tests administered by Educational Testing Service in Princeton, New Jersey for the purposes of college admission. These variables were included because it was thought that school outcomes may vary on both school and district characteristics.

District Scholastic Aptitude Tests

The New Jersey Department of Education requested that high schools which receive district mean SAT scores from the Educational Testing Service, based upon students from the district high schools taking the test, report those scores on a voluntary basis. Those districts which reported their scores did not indicate the proportion of their senior class which chose to be tested, which would have provided an additional outcome indice, as well as a method of adjusting reported scores. In addition, districts with more than one high school did not receive separate mean scores for each high school, but only a single district mean score. Nevertheless, 199 of the 293 (67.9%) reported mean SAT

Verbal and Mathematics scores. The mean school district SAT Verbal score was 415.51, with a minimum of 276 and a maximum of 508. The mean school district SAT Mathematics score was 456.61, with a minimum of 314, and a maximum of 554.

District Socioeconomic Status

The principal component analysis employed eight socioeconomic variables from the 1980 United States Census that were converted to the school district level by the National Center for Education Statistics (NCES). The factors were: (1) the average education level of males and females 25 years and over; (2) the average occupational level of males and females 16 years old and over (based on A.J. Reiss, (1961)); (3) the percent of people living in the same housing unit for at least the last ten years; (4) the average number of people per housing unit; (5) the percent urban population; (6) the average family income; (7) the percent of unemployed experienced males and females 16 years old and over; (8) the percent of families below the poverty level.

The resulting factor weights obtained were: education, 28%; occupational prestige, 23%; family income 20%; poverty level, 14%; unemployment, 11%; density, 4%; urbanization, 1%; mobility, 1%. A single measure of socioeconomic status, expressed as a standard score, was generated.

Other School District Characteristics

District student enrollment in 1984-85 averaged 5,669, with a minimum of 462, and a maximum of 54,768. The mean per pupil current expenditure was $4,287, with a minimum of $2,766, and a maximum of $7,232. The number of schools (elementary and secondary) in a school district averaged 9, with a minimum of 1 and a maximum of 80.

Analysis

To investigate possible association of the social, organizational, and financial variables on learning and related outcomes, a series of regression equations were run, using the Statistical Analysis System (SAS) backward stepwise procedures. The computer first entered all possible independent variables and then dropped the variable least closely associated with the outcome, with the other variables held constant, then the next least closely associated, and so on until all remaining variables were significant at the standard .05 level of significance. This allows the most consistent variables that are most closely associated with learning to be identified. Relationships between 18 dependent and 23 independent variables were examined. Socioeconomic status of schools and districts, however, were allowed to compete with the

organizational and financial variables to examine their relative contribution to learning, particularly in combination.

Results

Table 3 shows that in the analysis of the 23 independent variables, seven remained significant (at the .05 level of probability). Those remaining for one or more outcomes were: percent low income in a school; size of school; number of schools; percentage of teachers with a Bachelor's degree; pupil-teacher ratio; average teacher salary; district SES.

The most consistent factor related to school outcomes was district socioeconomic status (SES). It was significantly and positively associated with all but one of the 18 outcomes (suspensions) with the other variables entering the equations controlled. The second most consistent factor is the percent of students from low income families in the school; it was significantly and negatively associated with all but four of the outcomes (constructively employed, unsuspended, retained, and mean verbal SAT score).

School sizes and number of schools are the next most consistent. Ten of the achievement outcomes attained significance with school size. Six of the outcomes are significantly and negatively as-

sociated with school size; and retentions and several of the achievement test scores are higher in smaller schools.

Discussion

The size of public school districts and the schools within them normally depend on the number of school-age children in district boundaries and the percentage that elect to attend public schools. When governing units combine schools or school districts, they do so voluntarily because of the presumed benefits, either in program, or cost, or tax base, or reluctantly, under compulsion, as a result of legislative or judicial intervention. Advocates of large districts and schools argue that cost savings and diversified curricula can be effected by large organizational units. The trend has been toward school and school district consolidation. The number of school districts has declined from 22,010 in 1967-68 to 15,713 in 1986-87, and the number of secondary schools from 27,011 in 1967-68 to 23,389 in 1983-84 (National Center for Education Statistics, 1988, p. 83).

Recently, some states, such as Illinois, have enacted legislation with financial incentives for school districts to consolidate, presumably also creating larger schools within districts. Some researchers and public school educators have equated enormity with quality. Thus larger expenditures (Michelson, 1972), larger

schools and school districts (Cohn, 1975), more extensive curriculum offerings (Conant, 1959), larger percentage of staff with higher degree attainment and more experience (Jencks and Brown, 1975), smaller classes created by more staff (Hanushek, 1986), are not only desirable but essential for equality of educational opportunity. These beliefs are commonly held by educators and the public at large, although these were not characteristics of their own schooling, nor of American education even twenty years ago.

Although this study demonstrates an inverse relationship between school size and student outcomes, it does not inform us about why this effect occurs, although other studies provide tantalizing clues. Lindsay's (1982) findings suggest that increased school size has negative effects upon student participation, satisfaction, and attendance. Pittman and Haughwout (1987) suggest that large student bodies adversely affect the school climate, and a student's ability to identify with the school and its activities. It is reasonable to assert that students who are dissatisfied, do not participate in school activities, and are chronically absent or do not identify with the school will achieve less, whether on achievement tests or on some post-schooling measures. School size may also reflect the extent of parental participation (Guthrie, 1979), which undoubtedly contributes to student outcomes (Walberg, 1984).

Small schools may also differ in terms of staff interaction. Rutter and others (1979) found, in examining twelve schools in London, England, that staff emphasis upon academic studies, reflected by homework assigned, teacher expectation, and proportion of the school week devoted to teaching all positively affected scholastic attainment. Schneider (1985) studied four urban elementary schools, and found that the more effective schools had active parent councils, parents actively participating as volunteer tutors in classrooms, and smaller total student enrollments. She posits that teachers with fewer years of experience were more effective because they were still highly motivated compared to teachers with more experience. Monk (1982) found parental help on homework linked to differences in the allocation of teacher's time spent with students. Parental help substituted for small group work, both of which enhance achievement.

The size of schools may also affect the internal allocation of funds from the school district. Monk (1984) undertook a detailed study of school size and the internal allocation of school district resources to elementary schools in 466 regular K-12 New York school districts, with surprising results.

> "Among districts with the same total level of enrollment, those with (a)larger numbers of elementary schools, (b)larger average enrollments in their elementary schools, and (c) a greater degree of variation in the enrollment of one elementary school as compared to another spent more on super-

> vision and less on regular classroom instruction. In addition, districts with a relatively large number of high enrollment elementary schools tended to spend less on pupil services." (p. 59)

Thus, Monk found that as school districts increased either the number of schools in the district, or the size of the school, supervisory services were being financed at the expense of students' instructional services.

Considerable work in educational finance seeks to find the cheapest school size or district size. An optimal school size or district size is sought in relation to cost, and the increased costs above or below that size are estimated (Fox, 1981). There has even been a proposal to apply penalty factors to state aid for school districts, based upon their schools' deviation from the large, cost-effective optimal size (Cohn, 1975). It has been suggested that schools be merged during periods of enrollment decline, to lower per pupil costs (Riew, 1981). Others have hoped for economies of scale (Kenny, 1982), determining the lower cost of an additional student, and savings in the cost of procurement that may accrue. This involves determining a utilization rate cost relationship (Riew, 1986). Few such optimal size studies, however, assess achievement and other post-schooling outcomes.

Aside from economies of scale, the other justification of large high schools has been a belief in their ability to offer a com-

prehensive curriculum. "The enrollment of many American public high schools is too small to allow a diversified curriculum except at exorbitant cost" (Conant, 1959, p. 77). However, the most recent evidence suggests that larger schools may not, in fact, offer gains in curriculum comprehensiveness. In an extensive study in New York State of all school districts with 9-12 enrollments ranging in enrollment from below 100 to above 3000, Monk (1987) compared their curricular offerings.

> "The message these data convey is that an expanded, more specialized, more diversified curriculum is not guaranteed by large enrollment levels alone. A second, and related message, is that it is possible to offer at the 400 pupil level a curriculum that compares quite favorably in terms of breadth and depth with curriculum offered in much larger settings." (p. 148)

Monk also found that teachers in small schools (below 400) had heavier teaching loads, both in additional classes and preparations. However, they had smaller average class sizes. Large schools often failed to offer advanced classes, such as calculus, advanced placement English, advanced placement chemistry, and offered instead introductory courses, supporting charges of a "shopping mall" curriculum. He concludes "these findings suggest building smaller secondary schools than is customary." (p. 148)

Thus, the two major arguments for large schools, cost savings and curriculum enhancement, pale in comparison to positive schooling outcomes apparently achieved by small schools. The empirical

evidence for cost savings only applies if achievement and other positive schooling outcomes are not considered, and the empirical evidence for curricular offerings suggests that small schools are at least competitive, and possibly superior to, larger schools. In addition, the number of schools within districts seems to have independent effects on such important resource allocations as instruction.

The results of this study confirm a large number of previous studies that have demonstrated the lack of a consistent relationship between schooling outcomes and expenditure per pupil, teachers' salaries, teachers' degree status and experience (Hanushek, 1986). In addition, it is apparent that public school size and district size both influence schooling outcomes, and although other evidence of this relationship has accumulated, policy makers seem to ignore the finding and its significance. Much litigation has been undertaken to equalize expenditures per pupil, or to assure equivalent staff characteristics in an effort to increase learning, however, it appears that keeping schools relatively small might be more efficacious.

References

Barker, R.G. & Gump, R.V. Big school, small school: High school size and student behavior. Stanford, CA: Stanford University Press, 1964.

Chambers, J. (1972). An analysis of school size under a voucher system. ERIC ED085881.

Conant, J.B. The comprehensive high school. New York. McGraw-Hill, 1959.

Cohn, E. (1975). A proposal for school size incentives in state aid to education. Journal of education Finance, 1(2), 216-225.

Downey, R.G. (1978). Differences between entering freshmen from different size high schools. Journal of College Student Personnel, 19, 353-358.

Eberts, R.W., Kehoe, E., & Stone, J.A. (1984). The effect of school size on student outcomes. ERIC ED245382.

Fox, W. F. (1981). Reviewing economies of size in education. Journal of Education Finance, 6, 273-296.

Guthrie, J.W. (1979). Organizational scale and school success. Educational Evaluation and Policy Analysis, 1(1), 17-27.

Hanushek, E.A. (1986). The economics of schooling: Production and efficiency in public schools. Journal of Economic Literature, 24, 1141-1177.

Hyman, J.H., Wright, C.R., & Reed, J.S. (1975). The enduring effects of education. Chicago: University of Chicago Press.

Jencks, C.S. & Brown, M.D. (1975). Effects of high schools on their students. Harvard Educational Review, 45(3), 273-324.

Kenny, L.W. (1982). Economies of scale in schooling. Economics of education Review, 2(1), 1-24.

Kiesling, H. (1968). High school size and cost factors. U.S. Department of HEW, Office of Education, Bureau of Research.

Lindsay, P. (1982). The effect of high school size on student participation, satisfaction, and attendance. Educational Evaluation and Policy Analysis, 4(1), 57-65.

Michelson, S. (1972). Equal school resource allocation. Journal of Human Resources, 7(3), 283-306.

Monk, D.H. (1984). The conception of size and the internal allocation of school district resources. Educational Administration Quarterly, 20(1), 39-67.

Monk, D.H. (1982). Resource allocation in classrooms: an economic analysis. Journal of Curriculum Studies, 14(2), 167-181.

Monk, D.H. (1987). Secondary school size and curriculum comprehensiveness. Economics of Education Review, 6(2), 137-150.

National Center for Education Statistics (1988). Digest of Education Statistics, Washington, D.C.

Reiss, A.S. Occupations and Social Status. New York: Free Press, 1961.

Pittman, R. B. and Haughwout, P. (1987). Influence of High School Size on Dropout Rate. Educational Evaluation and Policy Analysis, 9(4), 337-343.

Riew, J. (1966). Economies of scale in high school operations. Review of Economics and Statistics, 48, 280-287.

Riew, J. (1981). Enrollment decline and school reorganization-a cost efficiency analysis. Economics of Education Review, 1(1), 53-73.

Riew, J. (1986). Scale economies, capacity utilization, and school costs: a comparative analysis of secondary and elementary schools. Journal of Education Finance, 2(4), 433-446.

Rutter, M., Maugham, B. Moritmore, P., Ouston, J., & Smith, A. Fifteen thousand hours: Secondary schools and their effects on children. Cambridge: Harvard University Press, 1979.

Schneider, B.L. (1985). Further evidence of school effects. Journal of Education Research, 78, 6, 351-356.

Summers, A.A. & Wolfe, B.L. (1976). Which school resources help learning? Efficiency and equity in Philadelphia public schools. IRCD Bulletin, 11(3), 1-17.

Walberg, H.J. (May, 1984). Improving the productivity of America's schools. Educational Leadership, 41, 19-27.

Walberg, H.J. & Fowler, W.J. (1987). Expenditure and size efficiencies of public school districts. Educational Researcher, 16(7), 5-13.

Wendling, W.W. & Cohen, J. (1981). Education resources and student achievement: Good news for schools. Journal of Education Finance, 7(1), 44-63.

Table 1

DEFINITION OF VARIABLES

SCHOOL CHARACTERISTICS

PERCENT MINORITY
Percentage of students within a school who fall into one of four minority categories (Black, Hispanic, Asian, and Pacific Islanders, or American Indian) as established by the Office of Civil Rights.

SCHOOL ENROLLMENT
Total enrollment for all grades in 1984-85, by school.

PUPIL/TEACHER RATIO
The ratio indicates how many students there are to a teacher, on average. Calculated by dividing the total number of pupils within a school by the number of teachers in that school.

PERCENT CONSTRUCTIVELY EMPLOYED
Follow-up on the percentage of pupils from a school who are now constructively employed. This figure is derived by dividing the number of follow-up students employed (which included students attending college) by all the students who were followed.

PERCENT UNSUSPENDED
Percentage of students within a school who were not suspended. Obtained by dividing the number of students suspended by the total enrollment and subtracting this number from one.

PERCENT RETAINED
Percentage of students within a school who could be influenced by the school and were retained. Calculated by adding the number of students who were excluded for administrative reasons, discipline, behavior, or academic reasons divided by the total enrollment of the school and then subtracted from one. Students who dropped out for reasons beyond school control include those who were married, pregnant, chose employment, or had emotional or social disabilities.

PERCENT LOW INCOME
Percentage of students in a school with family income less than $10,686. Calculated by dividing the number of students in the low income category by the total enrollment in the school.

TEACHER CHARACTERISTICS

AVERAGE SALARY
School's average teacher's salary for 1984-85.

NUMBER OF TEACHERS
Total number of full-time certificated classroom teachers in a school.

PERCENT OF TEACHERS WITH NO DEGREE
Teachers in a school who are certified to teach based on their experience and certification in the field rather than by degree, e.g., vocational education teachers.

PERCENT OF TEACHERS WITH BACHELOR'S DEGREE
Percentage of teachers in a school reported to possess a bachelor's degree.

PERCENT OF TEACHERS WITH MASTER'S DEGREE
Percentage of teachers in a school reported to possess a master's degree.

PERCENT OF TEACHERS WITH DOCTOR'S DEGREE
Percentage of teachers in a school reported to possess a doctor's degree.

PERCENT OF TEACHERS WITH OTHER DEGREES
Percentage of teachers in a school reported to possess degrees earned in foreign countries, or, for example, nursing degrees earned through hospital programs rather than college.

AVERAGE EXPERIENCE IN THE SCHOOL
Average number of years of teaching experience within the school presently employing the teacher.

AVERAGE EXPERIENCE IN THE DISTRICT
Average number of years of teaching experience within the district presently employing the teacher.

AVERAGE EXPERIENCE IN NEW JERSEY
Average number of years of teaching experience within the State of New Jersey.

AVERAGE EXPERIENCE IN EDUCATION
Average number of years of teaching experience within any State.

TEST CHARACTERISTICS

MINIMUM BASIC SKILLS

AVERAGE READING SCORE, N.J. MBS TEST
Average school reading test score on the Minimum Basic Skills (MBS) test administered in March, 1985 to all ninth grade students.

AVERAGE MATHEMATICS SCORE, N.J. MBS TEST
Average school mathematics test score on the Minimum Basic Skills (MBS) test administered in March, 1985 to all ninth grade students.

PERCENT FAILING READING MBS
Percentage of students failing the Reading MBS test within a particular school.

PERCENT FAILING MATHEMATICS MBS
Percentage of students failing the Mathematics MBS test within a particular school.

PERCENT FAILING BOTH READING AND MATHEMATICS MBS
Percentage of students failing both the Reading and the Mathematics MBS test within a particular school.

HIGH SCHOOL PROFICIENCY TEST

PERCENT PASSING READING HSPT
Percentage of students in a school passing (cutoff score of 75 on a 0 to 100 scale) the Reading High School Proficiency Test (HSPT administered in March, 1985 to all ninth grade students.

PERCENT PASSING MATHEMATICS HSPT
Percentage of students in a school passing (cutoff score of 75 on a 0 to 100 scale) the Mathematics High School Proficiency Test (HSPT administered in March, 1985 to all ninth grade students.

PERCENT PASSING WRITING HSPT
Percentage of students in a school passing (cutoff score of 75 on a 0 to 100 scale) the Writing High School Proficiency Test (HSPT administered in March, 1985 to all ninth grade students.

AVERAGE READING SCORE, HSPT
A school's average score for the Reading HSPT.

AVERAGE MATHEMATICS SCORE, HSPT
A school's average score for the Mathematics HSPT.

AVERAGE WRITING SCORE, HSPT
A school's average score for the Writing HSPT.

AVERAGE WRITING MULTIPLE CHOICE SCORE, HSPT
A school's average score for the multiple choice section of the Writing HSPT.

AVERAGE WRITING ESSAY SCORE, HSPT
A school's average score for the essay section of the Writing HSPT.

SCHOOL DISTRICT CHARACTERISTICS

SCHOLASTIC APTITUDE TEST (SAT)

AVERAGE VERBAL SAT SCORE
A district's average verbal SAT score for those students whose scores were reported to their district and whose district chose to release their scores to the New Jersey State Department of Education.

AVERAGE MATHEMATICS SAT SCORE
A district's average mathematics SAT score for those students whose scores were reported to their district and whose district chose to release their scores to the New Jersey State Department of Education.

DISTRICT ENROLLMENT
The total number of students enrolled in a district containing a school in this study as of September 30, 1984.

NUMBER OF SCHOOLS WITHIN A DISTRICT
The total number of schools within a school district boundary in the school year 1984-85.

PER-PUPIL EXPENDITURES
The actual cost of educating pupils within the local school district in 1984-85 as determined by audited expenditures. Expenditures for central office administration, instruction, attendance, health services, transportation, operations, maintenance, food services, student body activities, special projects (such as compensatory education), federal projects, and fixed charges (rent, employee benefits) are divided by the average daily enrollment of the district. Tuition paid to other school districts is excluded, as is community service, special school expenditures, capital outlay, improvement authorizations and debt service.

SOCIOECONOMIC STATUS

The measure of socioeconomic status of residents in each school district. A principal component analysis combined the following seven variables from the 1980 Census: educational level, occupational status, density, urbanization, income, unemployment and poverty. A standard score was generated that ranges approximately from +6 to -6. District factor groups were formed by dividing the ranked districts into equal-sized groups and assigning a letter from A (lowest) to J (highest). The letter groupings contain approximately 52 school districts each.

PER PUPIL PROPERTY WEALTH

A measure of the property wealth of each school district. Calculated by dividing the equalized valuation as of October 1, 1984 by the number of resident pupils on roll (including pupils in State Facilities) as of September 30, 1984.

Table 2
Univariate Statistics

Variable	# of Schools	Mean	S.D.	Min.	Max.	C.V.
<u>School Characteristics</u>						
Percent Minority	293	99.71	0.16	0	99.82	0.16
School Enrollment	332	1069.71	518.56	147.00	4018.00	48.48
Pupil-Teacher Ratio	293	15.18	2.00	7.16	23.19	13.14
Pct. Construc-tively Employed	284	90.59	8.51	50.11	100.00	9.39
Pct. Unsuspended	293	87.00	10.49	27.80	100.00	12.06
Pct. Retained	293	98.02	2.20	86.77	100.00	2.24
Pct. Low Income	293	10.22	16.28	0	88.14	159.40
<u>Teacher Characteristics</u>						
Avg. Teacher Salary	293	25533	3187	19051	34697	12.48
# of Teachers	293	73.47	32.14	19	233	43.75
Pct. Teachers without Degree	293	2.07	6.78	0	44.83	327.84
Pct. Teachers with B.A.	293	53.49	14.56	15.56	87.0	27.23
Pct. Teachers with M.A.	293	43.43	15.61	3.45	84.44	35.95
Pct. Teachers with Doctorate	293	0.92	2.17	0	25	234.14
Pct. Teachers with Other	293	.087	0.44	0	3.76	501.57
Avg. Years Exp. in this school	293	9.83	2.61	0.95	16.63	26.59

Table 2, cont.

Variable	# of	Mean	S.D.	Min.	Max.	C.V.
Avg. Years Exp. in this district	293	11.35	2.81	2.08	19.39	24.74
Avg. Years Exp. in New Jersey	293	13.02	2.64	5.73	19.47	20.26
Avg. Total Exp.	293	13.61	2.67	5.73	20.00	19.66
<u>State Test Scores</u>						
Avg. Reading Score, MBS	293	93.64	4.43	76.52	99.23	4.73
Avg. Math Score, MBS	293	86.87	5.31	69.78	95.92	6.12
Pct. Failing Reading MBS	293	3.15	3.84	0	22.78	122.04
Pct. Failing Math MBS	293	2.92	2.83	0	16.54	97.10
Pct. Failing Both Reading and Math MBS	293	1.40	2.18	0	12.74	155.88
Pct. Passing Reading HSPT	293	72.47	18.95	13.3	98.80	26.15
Pct. Passing Math HSPT	293	60.85	21.13	7.2	95.20	34.72
Pct. Passing Writing HSPT	293	57.13	20.00	6.4	93.20	35.01
Avg. Reading HSPT Score	293	80.75	7.62	56.0	91.60	9.44
Avg. Math HSPT Score	293	65.10	9.29	40.4	83.60	14.27
Avg. Writing HSPT Score	293	80.39	4.52	66.9	91.50	5.63

Table 2, cont.

Variable	# of	Mean	S.D.	Min.	Max.	C.V.
Avg. Writing multiple choice HSPT Score	293	78.60	6.23	59.2	88.40	7.93
Avg. Essay HSPT Score	293	7.67	0.80	5.0	10.00	10.41
<u>District Characteristics</u>						
Avg. SAT Verbal Score	199	415.51	42.22	276.0	508.0	10.16
Avg. SAT Math Score	199	456.61	46.84	314.0	554.0	10.26
Student Enrollment	293	5669.43	10090.6	462.0	54768	177.98
Per-Pupil Expenditure	290	4287	735	2766	7232	17.15
Socio-economic Status	276	-0.17	2.2	-6.53	5.71	-1316.6
Per-Pupil Property Wealth	292	210079	131313	26055	1072205	62.51
# of Schools in District	293	8.70	14.27	1	80	163.99

Table 3
Results of Backward Stepwise Regression

Dependent Variables	Constant	Percent Low Income	District SES	School Size	Number of Schools	Percent Teachers With B.A.	Pupil/ Teacher Ratio	Average Teacher Salary	Beginning R2	Ending R2
Minimum Basic Skills Test										
Avg. Reading Score	95.01	-0.10	0.93		-0.16	0.020			0.7463	0.7414
Avg. Math Score	89.12	-0.12	1.31		-0.092				0.6859	0.6827
Pct. Passing Reading	99.66	-0.082	0.72	-0.00056	-0.12	0.030	-0.13		0.6270	0.6232
Pct. Passing Math	97.97	-0.075	0.42						0.4638	0.4528
Pct. Passing Both Reading and Math	100.20	-0.081	0.14		-0.108				0.6010	0.5957
High School Proficiency										
Avg. Reading Score	84.85	-0.16	1.71		0.25				0.7899	0.7845
Avg. Math Score	65.34	-0.17	2.73	-0.00180			0.29		0.7459	0.7422
Avg. Writing Score	82.35	-0.057	1.26		-0.12				0.7319	0.7229
Avg. Mulpt. Choice. Score	82.35	-0.11	1.46	-0.00075	-0.16				0.7467	0.7459
Avg. Essay Writing Score	7.99	-0.0078	0.22		-0.021				0.6468	0.6429
Pct. Passing Reading	79.34	-0.39	4.50	-0.00200	-0.47	0.080			0.7772	0.7755
Pct. Passing Math	62.37	-0.42	5.67	-0.00480			0.67		0.7500	0.7452
Pct. Passing Writing	64.78	-0.24	5.66		-0.407				0.7033	0.6982
District SAT Score										
Avg. Verbal Score	395.23	16.86	-1.45			0.55			0.6696	0.6570
Avg. Math Score	438.11		19.46		-1.20	0.48			0.6726	0.6532
Other Outcome Measures										
Pct. of Students Constructively Employed	102.03		1.61				-0.74		0.2137	0.1909
Pct. of Students Unsuspended	68.30	-0.25						0.00081	0.1862	0.1752
Pct. of Students Influenced by School and Retained	99.19		0.48	-0.00008					0.3252	0.3407

Note: results that appear are significant at the .05 level.